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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/854,673	05/15/2001	Toshimitu Kimura	040679/1263	1146

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EXAMINER
WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
1742	3

DATE MAILED: 07/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

A-3

Office Action Summary	Application No.	Applicant(s)	
	09/854,673	KIMURA ET AL.	
	Examiner	Art Unit	
	Harry D Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-7 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 15 May 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-7 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the composition, except for the range of Si, and the method, does not reasonably provide enablement for the entire claimed scope of composition of Si. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The claimed scope of composition could include 0.41 wt% Si, 5.0 wt% Si, 20.0 wt% Si or even 50 wt% Si. The entire scope of the claimed composition is not been enabled by the specification. In addition, one of ordinary skill in the art would not be able to practice this invention without undue experimentation in order to find the maximum amount of Si that can be present in the steel.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watari et al (US 5,922,145) in view of "Annealing of Steel".

Regarding claim 5, Watari et al teach a machine structural steel composition. The composition contains (see col 2, lines 50-67) 0.2-0.6 wt% C, 0.05-1.5 wt% Si, 0-2 wt% Ni, 0-2 wt% Cr, 0-0.5 wt% Mo.

Watari et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one of ordinary skill in the art to have applied spheroidizing to the steel of Watari et al for the conventional purpose of improving the cold formability of the steel.

Regarding the limitation on the size of the carbides, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size because the composition taught by Watari et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 6, "Annealing of Steel" teaches (see middle column, page 46) that spheroidizing can be heating to a temperature just above Ac_1 followed by very slow cooling in the furnace. Table 4 (see page 47) discloses the general method of spheroidizing for low-alloy steels to obtain a ferritic/spheroidized carbide structure includes heating at about 700-800°C and cooling to about 600°C at a rate of 5°C/hr. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional spheroidizing treatment to the steel of Watari et al because the

conventional treatment produces a fine ferritic/spheroidized carbide structure in low alloy steels.

Regarding claim 1, Watari et al teach (as above) a composition that overlaps the presently claimed composition. One of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed because the composition taught by Watari et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 2, the composition of Watari et al is identical and the process of "Annealing of Steel" is identical to the claimed composition and method. Therefore, one of ordinary skill in the art would have expected the steel to contain at least one type of carbide selected from MC, M_2C, M_7C_3, $M_{23}C_6$ and M_6C.

Regarding claim 3, "Annealing of Steel" teaches (see Table 4, page 47) that the typical hardness after spheroidizing is 163-212 HB. This converts to about 168-217 HV. Therefore, one of ordinary skill in the art would have expected the steel of Watari et al in view of "Annealing of Steel" to have the Vickers hardness as claimed.

5. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watari et al (US 5,922,145) in view of "Annealing of Steel" as applied to claims 1-3 and 5-6 above, and further in view of "Introduction to Surface Hardening of Steels" and "Tempering of Steel".

Regarding claim 7, the teachings of Watari et al and "Annealing of Steel" are discussed above in paragraph no. 4. The method disclosed by "Annealing of Steel" does not include performing carburizing and tempering after the spheroidizing.

"Introduction to Surface Hardening of Steels" teaches (see page 259, 1st column) that surface hardening is used to improve the wear resistance of parts without affecting the tough interior of the part. "Introduction to Surface Hardening of Steels" describes, on pages 260-263, the most conventional method of surface hardening, carburizing.

"Tempering of Steel" teaches (see page 121) that tempering is a process that is used on previously hardened steel to increase ductility and toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied carburizing, as taught by "Introduction to Surface Hardening of Steels", and tempering, as taught by "Tempering of Steel", to the steel of Watari et al in view of "Annealing of Steel" because the carburizing improves the wear resistance of the surface of the steel and the tempering restores toughness to the surface of the steel.

It would have been within the expected skill of a routineer in the art to have performed machining on the part of Watari et al in view of "Annealing of Steel" before the carburizing in order to get the part into the final desired shape before the hard case was formed during carburizing.

Regarding claim 4, because the composition and process taught by Watari et al in view of "Annealing of Steel", "Tempering of Steel" and "Introduction to Surface Hardening of Steels" are identical to the presently claimed invention, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment

of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed.

6. Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi et al (US 5,746,842) in view of "Annealing of Steel".

Eguchi et al teach a steel composition that contains (see col 2, lines 40-65) 0.1-0.35 wt% C, 0.5-2.5 wt% Si, 0.01-2.5 wt% Cr, 0.01-0.7 wt% Mo and 0.01-2 wt% Ni. The composition of Eguchi et al overlaps the presently claimed composition for every element except C. However, it would have been within the expected skill of a routineer in the art to have optimized the composition of C in the steel in order to maximize the strength of the steel (see col 5, lines 58-59).

Eguchi et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one of ordinary skill in the art to have applied spheroidizing to the steel of Eguchi et al for the conventional purpose of improving the cold formability of the steel.

Regarding the limitation on the size of the carbides, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size because the composition taught by Eguchi et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 6, "Annealing of Steel" teaches (see middle column, page 46) that spheroidizing can be heating to a temperature just above Ac_1 followed by very slow

cooling in the furnace. Table 4 (see page 47) discloses the general method of spheroidizing for low-alloy steels to obtain a ferritic/spheroidized carbide structure includes heating at about 700-800°C and cooling to about 600°C at a rate of 5°C/hr. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional spheroidizing treatment to the steel of Eguchi et al because the conventional treatment produces a fine ferritic/spheroidized carbide structure in low alloy steels.

Regarding claim 1, Watari et al teach (as above) a composition that contains the presently claimed composition. One of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed because the composition taught by Eguchi et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 2, the composition of Eguchi et al is identical and the process of "Annealing of Steel" is identical to the claimed composition and method. Therefore, one of ordinary skill in the art would have expected the steel to contain at least one type of carbide selected from MC, M_2C, M_7C_3, $M_{23}C_6$ and M_6C.

Regarding claim 3, "Annealing of Steel" teaches (see Table 4, page 47) that the typical hardness after spheroidizing is 163-212 HB. This converts to about 168-217 HV. Therefore, one of ordinary skill in the art would have expected the steel of Eguchi et al in view of "Annealing of Steel" to have the Vickers hardness as claimed.

7. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi et al (US 5,746,842) in view of "Annealing of Steel" as applied to claims 1-3 and 5-6 above, and further in view of "Introduction to Surface Hardening of Steels" and "Tempering of Steel".

Regarding claim 7, the teachings of Eguchi et al and "Annealing of Steel" are discussed above in paragraph no. 4. The method disclosed by "Annealing of Steel" does not include performing carburizing and tempering after the spheroidizing.

"Introduction to Surface Hardening of Steels" teaches (see page 259, 1st column) that surface hardening is used to improve the wear resistance of parts without affecting the tough interior of the part. "Introduction to Surface Hardening of Steels" describes, on pages 260-263, the most conventional method of surface hardening, carburizing.

"Tempering of Steel" teaches (see page 121) that tempering is a process that is used on previously hardened steel to increase ductility and toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied carburizing, as taught by "Introduction to Surface Hardening of Steels", and tempering, as taught by "Tempering of Steel", to the steel of Eguchi et al in view of "Annealing of Steel" because the carburizing improves the wear resistance of the surface of the steel and the tempering restores toughness to the surface of the steel.

It would have been within the expected skill of a routineer in the art to have performed machining on the part of Eguchi et al in view of "Annealing of Steel" before the carburizing in order to get the part into the final desired shape before the hard case was formed during carburizing.

Regarding claim 4, because the composition and process taught by Eguchi et al in view of "Annealing of Steel", "Tempering of Steel" and "Introduction to Surface Hardening of Steels" are identical to the presently claimed invention, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed.

8. Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al (US 4,773,947) in view of "Annealing of Steel".

Shibata et al teach a steel composition that contains (see abstract) 0.03-0.2 wt% C, 1-3 wt% Si, up to 2 wt% Cr, up to 0.5 wt% Mo and up to 2 wt% Ni. The composition of Shibata et al overlaps the presently claimed composition.

Shibata et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one of ordinary skill in the art to have applied spheroidizing to the steel of Shibata et al for the conventional purpose of improving the cold formability of the steel.

Regarding the limitation on the size of the carbides, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size because the composition taught by Shibata et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 6, "Annealing of Steel" teaches (see middle column, page 46) that spheroidizing can be heating to a temperature just above Ac_1 followed by very slow cooling in the furnace. Table 4 (see page 47) discloses the general method of spheroidizing for low-alloy steels to obtain a ferritic/spheroidized carbide structure includes heating at about 700-800°C and cooling to about 600°C at a rate of 5°C/hr. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional spheroidizing treatment to the steel of Shibata et al because the conventional treatment produces a fine ferritic/spheroidized carbide structure in low alloy steels.

Regarding claim 1, Shibata et al teach (as above) a composition that overlaps the presently claimed composition. One of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed because the composition taught by Shibata et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claim 2, the composition of Shibata et al is identical and the process of "Annealing of Steel" is identical to the claimed composition and method. Therefore, one of ordinary skill in the art would have expected the steel to contain at least one type of carbide selected from MC, M_2C, M_7C_3, $M_{23}C_6$ and M_6C.

Regarding claim 3, "Annealing of Steel" teaches (see Table 4, page 47) that the typical hardness after spheroidizing is 163-212 HB. This converts to about 168-217 HV.

Therefore, one of ordinary skill in the art would have expected the steel of Shibata et al in view of "Annealing of Steel" to have the Vickers hardness as claimed.

9. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al (US 4,773,947) in view of "Annealing of Steel" as applied to claims 1-3 and 5-6 above, and further in view of "Introduction to Surface Hardening of Steels" and "Tempering of Steel".

Regarding claim 7, the teachings of Shibata et al and "Annealing of Steel" are discussed above in paragraph no. 4. The method disclosed by "Annealing of Steel" does not include performing carburizing and tempering after the spheroidizing.

"Introduction to Surface Hardening of Steels" teaches (see page 259, 1st column) that surface hardening is used to improve the wear resistance of parts without affecting the tough interior of the part. "Introduction to Surface Hardening of Steels" describes, on pages 260-263, the most conventional method of surface hardening, carburizing.

"Tempering of Steel" teaches (see page 121) that tempering is a process that is used on previously hardened steel to increase ductility and toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied carburizing, as taught by "Introduction to Surface Hardening of Steels", and tempering, as taught by "Tempering of Steel", to the steel of Shibata et al in view of "Annealing of Steel" because the carburizing improves the wear resistance of the surface of the steel and the tempering restores toughness to the surface of the steel.

It would have been within the expected skill of a routineer in the art to have performed machining on the part of Shibata et al in view of "Annealing of Steel" before

the carburizing in order to get the part into the final desired shape before the hard case was formed during carburizing.

Regarding claim 4, because the composition and process taught by Shibata et al in view of "Annealing of Steel", "Tempering of Steel" and "Introduction to Surface Hardening of Steels" are identical to the presently claimed invention, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Aoki et al (US 5,107,711) teach a composition that contains the claimed composition;

b. Miyaguchi et al (DE 19955565) teach a composition that contains the claimed composition;

c. Murai (JP 05-059427) teaches a composition that contains the claimed composition;

d. Murai et al (JP 06-287712) teach a composition that contains the claimed composition;

e. Takada et al (JP 62-260042) teach a composition that contains the claimed composition;

f. Takahashi et al (JP 61-174321) teach a spheroidizing annealing method that includes heating at 730-850°C for 20 sec-3 hr followed by slow cooling at 0.5-30°C/min (outside the scope of the present invention);

g. Dubois et al (WO 2000/00658) teach a composition that overlaps the claimed composition;

h. Watari et al (EP 1,069,198) teach a composition that contains the claimed composition.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-F 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
June 27, 2002

SCOTT KASTLER
PRIMARY EXAMINER